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Supply & installation of
Propane Conversion Kits
for Regional Police Vehicles
- purchase documents
1981

MAR 5 1981
PURCHASING DEPT.
HAMILTON WENTWORTH REGIONAL POLICE
246/AUG78

memorandum

TO Chief of Police G.V. Torrance DATE March 2nd, 1981

REFERENCE

CONVERSION - Gasoline to Liquid Propane Gas Vehicle Patrols

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GOVERNMENT DOCUMENTS

Since November 1980, this department has been studying the advisability of using liquid propane gas to fuel our mobile patrol vehicles, and we have concluded that propane is a viable alternative to gasoline and should achieve definite cost savings.

The Ministry of Transportation and Communications for the Ontario Government is in its second month of a one year study involving 200 vehicles; Niagara Regional Police has just commenced a pilot project of 20 mobile patrol vehicles; Sudbury, Halton and Brantford Police forces are showing an interest. We are informed that there are more than 500,000 vehicles operating on propane in Europe, 250,000 in the U.S.A. and all the taxi fleets in Japan using this same fuel. It is known that 90% of all fork-lift trucks are so propelled.

We have been in contact with several companies involved in liquid propane gas conversions, namely Procan Conversions, St. Catharines; Capital Equipment, Hamilton; Alternative Fuel Systems Ltd., Windsor; I.C.G. Canadian Propane Ltd., Toronto.

We have consulted and involved Hamilton-Wentworth Regional Engineering, City of Hamilton Purchasing Department, City of Hamilton Garage Section, The Hamilton-Wentworth Police Association Safety and Health representative, our own Planning & Research Section; and Inspector D. Larson who heads our Kenilworth Division which is the proposed test site recommended in this report.

We have contacted and received reports and material from City of South San Francisco Police Force, West Vancouver Police Force and the Department of Research and Development, International Association of Chiefs of Police.

From all of the above, we gleaned the necessary information to establish the following which we review under three principal considerations:-

(1) Mechanical

(2) Financial

(3) Fuel Supply

1. MECHANICAL

Advantages

- propane burns more efficiently than gasoline resulting in more complete combustion and releasing a greater portion of its gross energy content as usable energy.

- no lead or carbon deposits resulting in increased engine life; consequently fewer oil changes and spark plug servicings are required.

- propane is in a gaseous state when it enters the combustion chamber, therefore, there is no wash-down of cylinder walls and no oil dilution.

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GOVERNMENT DOCUMENTS

TO: Chief of Police G.V. Torrance

RE: CONVERSION - Gasoline to Liquid Propane Gas Vehicle Patrols

1. MECHANICAL - Advantages (Continued)

- a propane conversion kit has fewer moving parts than a gasoline carburetor or fuel injection system.
- reduced maintenance requirements permit more efficient timing of routine maintenance and reduced vehicle downtime.
- life expectancy of a conversion kit is up to twenty (20) years. The kit is interchangeable between vehicles.
- No polluting emissions exhausted.
- New car warranty prevails if conversion done by qualified mechanic.
- propane components fabricated for safety.
- hi tensile strength steel tanks 20 times the impact resistance of gasoline tanks.
- shut-off valves prevent fuel leakage.
- fuel lines leakproof and stronger than gasoline lines.

Disadvantages

- fewer miles per gallon and reduced engine horsepower (average of 5-10% less) with propane due to lower energy content per unit volume.
- engine modifications necessary.
- mechanics must be licensed to convert, service and repair propane fuelled vehicles.
- engine must be properly tuned to prevent major damage.
- propane tank cuts down on storage space.
- some suggestion of hi speed heating by Michigan State Police.

2. FINANCIAL

Advantages

- 7% sales tax exemption on vehicle purchased.
- there is no provincial road tax on propane when used as a vehicle fuel.
- $400 conversion grant is available from the Federal Government.
- 40% price differential between gas and propane (per gallon) is expected to continue indefinitely.

Disadvantages

March 2nd, 1981

TO: Chief of Police G.V. Torrance

RE: CONVERSION - Gasoline to Liquid Propane Gas Vehicle Patrols

SAMPLE: PAY BACK CALCULATIONS - CONVERSION TEN 1981 MERCURY METEOR, 302 V8 VEHICLES (BASED ON CAPITAL COSTS ONLY)

- ESTIMATED ANNUAL MILEAGE PER VEHICLE 47,450

	GASOLINE	L.P.G.
ESTIMATED MILES PER GALLON	14	12.6
ANNUAL FUEL CONSUMPTION PER VEHICLE (47,450 ÷ 14) (47,450 ÷ 12.6)	3,389.285	3,765.873
COST PER GALLON	$ 1.23	77.1¢
ANNUAL FUEL COST PER VEHICLE (3,389.28 X $1.23) (3,765.87 X 77.1¢)	$ 4,168.20	$ 2,903.48
ANNUAL FUEL COST - 10 VEHICLES ($4,168.20 X 10) ($2,903.48 X 10)	$41,688.20	$29,034.88
MONTHLY FUEL COST - 10 VEHICLES ($41,688.20 ÷ 12) ($29,034.88 ÷ 12)	$ 3,474.01	$ 2,419.57

DIFFERENCE PER MONTH - 10 VEHICLES - $ 1,054.44
($3,474.01 - $2,419.57)

COST OF 10 CONVERSIONS (LESS GRANTS & TAX) $ 5,891.00
($1,500.00 X 10)
($15,000.00 - $9,109.00)

ESTIMATED PAY BACK PERIOD 5.58 MONTHS
($5,891.00 ÷ $1,054.44)

March 2nd, 1981

TO: Chief of Police G.V. Torrance

RE: CONVERSION - Gasoline to Liquid Propane Gas Vehicle Patrols

3. FUEL SUPPLY

Advantages

- surplus of propane in Canada.
- better control of fuel inventory by reducing chance of wastage due to spillage or pilferage.

Disadvantages

- must be HD5 propane.
- no 24 hour supply source available.
- personnel may have to be licensed to refuel propane vehicles.

At the present time, the Ministry of Transportation and Communications is conducting a propane fuel demonstration project, in which they are monitoring the performance of approximately 200 converted vehicles across the province for a period of one year.

The comparative research will be conducted by our own Research and Planning Section with the help of the Ministry of Transport and Communications using the same criteria as the Ministry.

RECOMMENDATIONS - In consideration of all of the above, we recommend that:-

(1) ten 1981 Mercury Meteor 302 V8 vehicles presently on order be converted to exclusive propane fuel on delivery from the dealer;

(2) all ten vehicles be located at the Kenilworth Division where they are subject to urban patrol use;

(3) a comparative research of these vehicles with ten similar gasoline fuelled vehicles located at Central Division be conducted over a suitable period of time - one year suggested.

(4) the cost of conversion be taken from Account #0388-3237 with rebates credited to that account as received;

(5) a pre-conversion induction and training program be conducted with all Kenilworth Division personnel to assure their co-operation and alleviate their concerns;

(6) detailed specification be drafted to cover all aspects of the conversion program - e.g.

- conversion kit and costs
- service, warranty and costs
- fuel supply and costs

and that quotations from all interested companies be solicited by our Purchasing Department.

 March 2nd, 1981

TO: Chief of Police G.V. Torrance

RE: CONVERSION - Gasoline to Liquid Propane Gas Vehicle Patrols

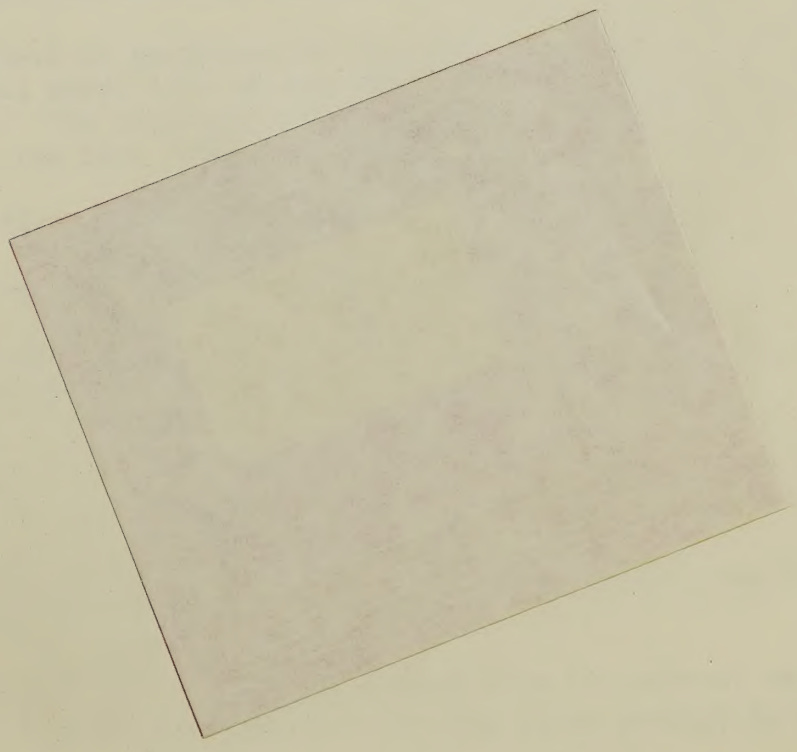
Recommendations - Continued

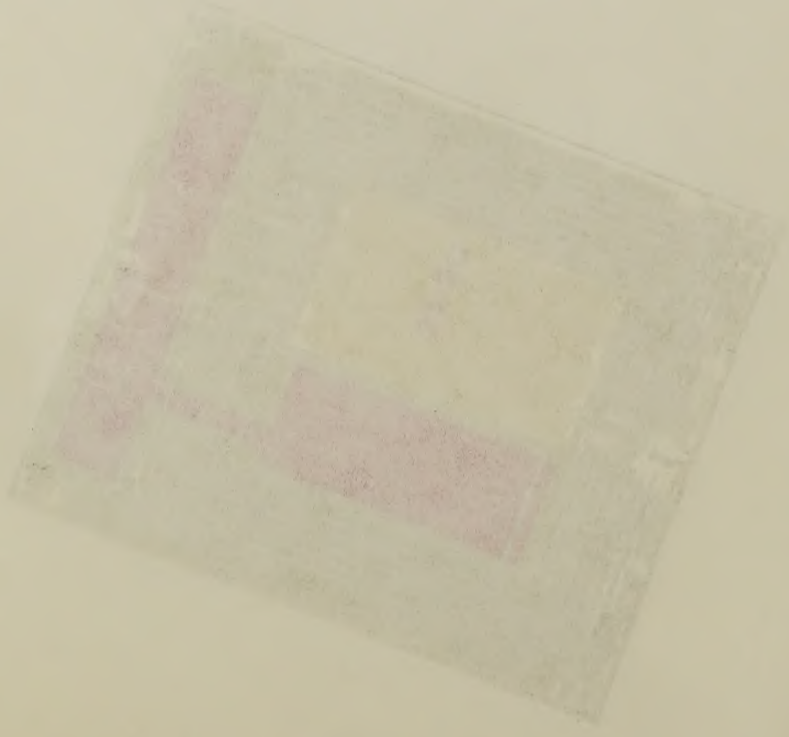
(7) a report of the research conducted be made to the Board at the end of the established research period.

RTC:jd

Robert T. Collings,
Staff Superintendent.

cc: Sergeant J. Hanson
Mr. Tom Bradley, Purchasing Department
Sergeant J. Garchinski
Mr. Terry Bunce, Finance Department
Mr. Heinz O. Schweinbenz, Regional Engineering





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SPECIFICATION FOR THE SUPPLY & INSTALLATION OF TEN (10) LIGHT VEHICLE PROPANE CONVERSION KITS

REGIONAL POLICE

Sealed tenders addressed to The Chairman, c/o E.A. Simpson, Esq., Secretary, Board of Commissioners of Police, City Hall, Hamilton, Ontario, will be received up to ELEVEN o'clock A.M., (E.S.T.) Wednesday, April 22nd, 1981, for the supply of propane, and cost of installation of ten (10) light vehicle propane conversion kits.

GENERAL: This specification is intended to govern the supply and installation of ten (10) light vehicle propane conversion kits to the following police vehicles rendering them exclusively operable on LPG:

	Year	Make	Engine
(10)	1981	Meteor Mercury	302 V8

DETAILED SPECIFICATION

The supplier shall comply with the following requirements:

1) The installer shall be qualified for S6A fitters certificate from the Ministry of Consumer and Commercial Relations.

2) Only ULC or UL approved equipment which is accepted by the Fuels Safety Branch of the Ministry of Consumer and Commercial Relations shall be used. Specify the manufacturer and model and warranty period.

3) A dynamometer test shall be performed on five (5) vehicles before and after the conversion. The total power loss at any usable point in the engine power curve shall not exceed 10%. The supplier shall provide rating sheets containing calibration data for the five vehicles.

4) Internal engine modifications.

The following modifications shall be performed by the supplier.

- The cooling system performance shall be checked with reference to the manufacturer's specifications, and any deficiencies rectified, before the conversion is made.

- Hardened valves and valve seats shall be installed in engines not already so equipped.

- The distributor total advance, and the distributor advance curve shall be modified as necessary for efficient performance.

- The inlet manifold shall be thermally isolated from the exhaust manifold. This will normally involve blocking off the heat riser passage between

the two manifolds.

- Spark plugs of the correct heat range for propane use shall be installed.

- No emissions related engine equipement shall be removed in the process of conversion, except as noted above and written notice shall be given for any modifications in the original emissions systems.

- Written results of emissions control test after propane conversion shall be provided for each vehicle.

5) Fuel System Modifications

The following modifications shall be made, and all necessary equipment shall be supplied.

- A 16" x 42", 22.6 imperial gallon (water capacity) fuel tank shall be securely mounted in the bottom of the trunk with a remote fill situated in the left rear fender at the rear of the factory installed gasoline fill outlet. The remote fill shall be a key-lock assembly with couplings for fill and outages valves, part G1981 manufactured by Almac Engineering Inc., 20769 Mound Road, Warren, Michigan, 48091, or approved equal.

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- A dash mounted LPG fuel gauge shall be provided.

- Bottom of trunk to be vented to the outside with a one way vent.

- The carburetor shall be chosen to have an air flow capacity in excess of the rated maximum engine air flow requirement. The engine air flow requirement may be determined as follows:

  Engine displacement (C.I.D.) x Max. RPM divided by 1728 (cubic inches per cu. ft.). The result if divided by 2 for a 4 stroke engine, and then multiplied by .85 to compensate for charging inefficiency.

  E.g. Air flow requirement = $\frac{\text{C.I.D. x R.P.M.}}{1728 \times 2} \times .85$

  The carburetor chosen must have an air flow capacity exceeding this figure.

- Push button cold start system to be installed.

- A vapourizer of adequate capacity shall be securely installed at a point below the top of the radiator top tank, and the necessary connections made to the engine cooling system. The vapour line to the carburetor shall be as short as possible.

- The line from the tank to the vapourizer shall incorporate a filter and an electrical or vacuum fuel shut-off which shall prevent fuel flow when the ignition is turned off, or in the event of an engine stoppage with the ignition turned on.

- All fuel and vent line connections must be made with a CGA or UL approved pipe dope, and all connections shall be leak tested before the vehicle is delivered.

- The hose used must be approved by the Canadian Gas Association for propane use, and the fittings shall be UL approved. The fuel feed line from the tank shall pass propane at a rate which will close the excess flow rate valve in the event of a line rupture and shall, in any case, be at least #6 hose.

- The inlet air 'stove' shall be disconnected.

- A replaceable, dry element air filter of adequate capacity shall be provided.

6) The entire installation shall conform to the requirments of the Canadian Gas Association standard B149.2, and the Engery Act of Ontario 1971, Chapter 44 and their latest revisions.

7) The specification covers only those points of particular interest. Nothing in this specification shall exempt the supplier from his responsibility to provide a safe, efficient, conversion.

Original manufacturing vehicle parts not required, remain the property of the Regional Municipality of Hamilton-Wentworth Police Department and are to be returned with the vehicle once converted.

The Supplier must be able to supply parts and service on the conversion kits within a 24-hour period.

The Supplier shall agree to allow Regional Police staff to be present during conversion kit installation.

The lowest or any part of any tender shall not necessarily be accepted.

ISSUED ON BEHALF OF THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
THE CORPORATION OF THE CITY OF HAMILTON

T. Bradley,
Director of Purchases

City Hall,
Hamilton, Ontario,
April 8th, 1981.

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

TEN (10) LIGHT VEHICLE PROPANE CONVERSION KITS.
FORM OF TENDER

E. A. Simpson, Secretary,
Board of Commissioners of Police,
Regional Municipality of Hamilton-Wentworth,
City Hall, Hamilton, Ontario.

Gentlemen:

We, the undersigned, herewith agree to supply and install Ten (10) Light Vehicle Propane Conversion Kits, in accordance with specifications issued by the Director of Purchases, April 8th, 1981, at the following price:

	PRICE INCLUDING FEDERAL SALES TAX UNIT	TOTAL
Ten (10) Light Vehicle Propane Conversion Kits as specified	$ 952.00	$ 9,520.00
Ontario Retail Sales Tax 7%	As per attached	$
Installation	$ 180.00	$ 1,800.00
Total Price for Supply and Installation		$ 11,320.00

Manufacturer IMPCO CARBURETION EQUIPMENT

Model CA 225

No. of days to complete installation 10 Days

Warranty Period As per manufacturers warranty on equipment supplied from date of Installation 2 years.
Workmanship warranted for 90 days

SUPERIOR PROPANE LIMITED
Name of Tenderer

Box 70, SMITHVILLE, Ontario LOR 2A0
Address of Tenderer

by J. Wemmered.
Authorized Signature

Date of Tender:

April 21,st 1981.

Telephone No 945-5493 or 528-7734

NOTE: This Form of Tender is issued in duplicate, please retain one copy for your records.

SUPERIOR PROPANE LIMITED

DISTRIBUTORS OF Superior PROPANE AND APPLIANCES

THROUGHOUT CANADA

PLEASE NOTE:

The 16 X 42 motor fuel tank is recommended to be equiped with the 80% automatic shut - off "Stop fill" assembly valve which is a Safety feature to ensure the correct filling level of the storage tank.

The filling time is not appreciably affected by the stop fill Safety valve feature, and when utilized, it is not necessary to seal the tank compartment from the passenger area nor from radio equipment if located in the trunk storage area.

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